Landbird Monitoring

Channel Islands National Park
1995–2000 Annual Report

Technical Report 2001-03

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ABSTRACT

Landbird monitoring was conducted during 1993–2000 at Channel Islands National Park. Line transect counts were conducted on Santa Barbara, East Anacapa, Santa Rosa and San Miguel Islands, whereas point count transects were surveyed on Santa Rosa Island. Landbirds were surveyed during spring (March–May) and fall (October–November) seasons. As few as 5 of 10 transects on Santa Rosa Island were surveyed annually, due to time and personnel constraints. During line transect sampling, observers recorded all birds heard or seen within 100 m of the transect midline. Similarly, all birds seen or heard within 50 m of point count sites were recorded during point count sampling.

A total of 58 species was observed during spring, and a total of 70 species was observed during fall landbird monitoring. The number of species observed on each island varied annually, due primarily to unequal sampling effort and interannual variation in migrants. Not all regular breeders were observed annually, because the existing transects do not adequately sample all habitat types. Among point count transects on Santa Rosa Island, species richness (the number of species observed) was greatest for riparian transects, due probably to greater number of point count sites in riparian habitat, as well as to habitat characteristics.

In April of 2000, after 8 years of annual monitoring, the landbird monitoring program was reviewed and evaluated to determine resolution and statistical power and to reconsider methods.

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INTRODUCTION

National Park Service (NPS) managers are charged with maintaining all the components and processes of naturally evolving park ecosystems (NPS 1988). In order to make intelligent decisions regarding management of complex natural resource systems, managers of parks and other natural reserves require information on long-term resource condition and trend. Without such information, managers cannot gauge the effects of human activities on park resources, and therefore cannot prescribe and implement appropriate mitigative measures.

Recognizing that long-term datasets are required for management of park areas, the NPS has directed its managers to acquire such information in order to detect changes that may require mitigation and to provide reference points for comparison with other, more altered environments (NPS 1988). Accordingly, the NPS at Channel Islands National Park has initiated a long-term ecological monitoring program for both marine and terrestrial natural resources (Davis and Halvorson 1988) based primarily upon monitoring the relative abundance of selected organisms. This community-level approach was chosen rather than other indices (biodiversity, energy flux, nutrient budgets, etc.) because the former integrates the effects of a broad range of ecological factors, permits projections into the future, reflects chronic system effects quickly, can be measured simply and interpreted directly, and provides information at levels most amenable to management: that of the species and population (Davis 1989). Protocols for monitoring populations and communities of terrestrial resources have been designed for terrestrial vertebrates, terrestrial vegetation, landbirds, terrestrial invertebrates, and landbirds (Fellers and Arnold 1988, Halvorson et al. 1988, van Riper et al. 1988, Fellers and Drost 1991). In 1993, landbird population monitoring was initiated at Channel Islands National Park.

Other land management agencies and scientific organizations are initiating population monitoring programs for landbirds (Butcher et al. 1993, Geupel 1993, Manley 1993, Sauer 1993), prompted by an increasing concern about the effects of habitat destruction and fragmentation, and specific concerns for the fate of neotropical migrant species (Terborgh 1989, Hagan and Johnston 1992). The importance of monitoring landbird populations at Channel Islands National Park is underscored by the existence of several endemic insular subspecies on the islands as well as the recent history of habitat alteration due to human influences.

Landbird communities on Southern California's Channel Islands are well documented. As near-shore, or continental islands with faunal affinities to the adjacent mainland, California's Channel Islands have been the focus of studies on species composition and turnover among insular landbird populations (Diamond 1969, Power 1972, Lynch and Johnson 1974, Jones 1975, Jones and Diamond 1976, Power 1976, Diamond and Jones 1980, Kiff 1980) as well as studies on the origin and differentiation of island avifauna (Miller 1941, Miller 1951, Johnson 1972, Power 1979, Power 1980). Autecological studies have focused on endemic island subspecies such as the Santa Cruz Island scrub jay (*Aphelocoma coerulescens insularis*) (Atwood 1980), and San Miguel Island song sparrow (*Melospiza melodia micronyx*) (Sogge and van Riper 1988). Population monitoring of landbirds occurring on California's Channel Islands has not been previously attempted, although The Nature Conservancy is currently monitoring landbird populations on Santa Cruz Island (R. Klinger, Lyndal Laughrin, pers. comm.).

Breeding landbird communities on the islands are depauperate when compared to those of the mainland. Diamond and Jones (1980) summarized the breeding avifauna on the Channel Islands and noted the differences between island avifauna and that of the adjacent mainland. Approximately 160 species breed on the adjacent mainland, whereas each of the 8 Channel Islands support between 8 and 39 species. Mainland species absent on the islands include sedentary species such as the Wrentit (*Chamaea fasciata*) and California Towhee (*Pipilo crissalis*), strong overland fliers such as the Red-shouldered Hawk (*Buteo lineatus*) and Turkey Vulture (*Cathartes aura*) which are not inclined to cross water, and

species for which there exists no suitable breeding habitat on the islands such as Hermit Thrush (*Catharus guttatus*) and Fox Sparrow (*Passerella iliaca).* Those species which do breed regularly on the islands are characterized by a high degree of endemism. Of the approximately 41 island landbird species, 13 have differentiated into 18 endemic subspecies (Johnson 1972).

The landbird monitoring protocol developed for Channel Islands National Park (van Riper et al. 1988) is designed to monitor relative abundance of populations of landbird species which breed on Santa Barbara, Anacapa and San Miguel Islands through the use of line transect sampling during both the breeding and non-breeding seasons. Line transects utilizing existing trail systems were chosen over point counts because they minimize impact to vegetation while accurately sampling avian species composition, relative abundance and seasonal distribution patterns (Sogge et al. 1989). The landbird monitoring program developed for Santa Rosa Island (Super et al. 1991) primarily utilizes point count sampling which is more appropriate for that island's structurally complex habitats and rugged terrain, both of which make line transect sampling difficult to implement. Line transect sampling is most appropriate for sampling landbird populations in open, low-growth habitats (Dawson 1981), such as those on the smaller, less topographically diverse Channel Islands.

The objectives of the landbird monitoring program at Channel Islands National Park are to determine annual relative abundance of each species breeding on park islands and to detect substantial changes in the abundance and/or distribution of landbirds. Such changes may be due to either natural factors or human-caused influences; historic and recent land-use practices have had severe consequences for island avifaunas. For example, by 1959 the Santa Barbara Island Song Sparrow (*Melospiza melodia graminea*) had been driven to extinction due to a combination of conversion of native habitat for agricultural purposes, habitat destruction by introduced rabbits (*Oryctolagus cuniculus*) and other grazing stock, and predation by feral cats (*Felis catus*) (Sumner 1959). These same land-use practices on Santa Barbara Island have also reduced available breeding habitat for the Orange-crowned Warbler (*Vermivora celata sordida*), a neotropical migrant which, on Santa Barbara, nests only in the thick stands of *Coreopsis* scrub in the canyons. As the island recovers from the influences of past grazing, expansion of *Coreopsis* stands may be accompanied by an increase in breeding Orange-crowned Warblers. The landbird monitoring program is designed to detect such changes through correlation of landbird trends with attendant trends in other ecosystem components.

The Channel Islands Landbird Program was reviewed, evaluated, and the data analyzed in the spring of 2000. The results and recommendations of that review are covered in an internal report (McEachern, 2000).

The purpose of this report is to present results of landbird monitoring at Channel Islands National Park from the 1993 to 2000 field seasons. Data presented include abundance counts for line transect and point count sampling and data on species richness.

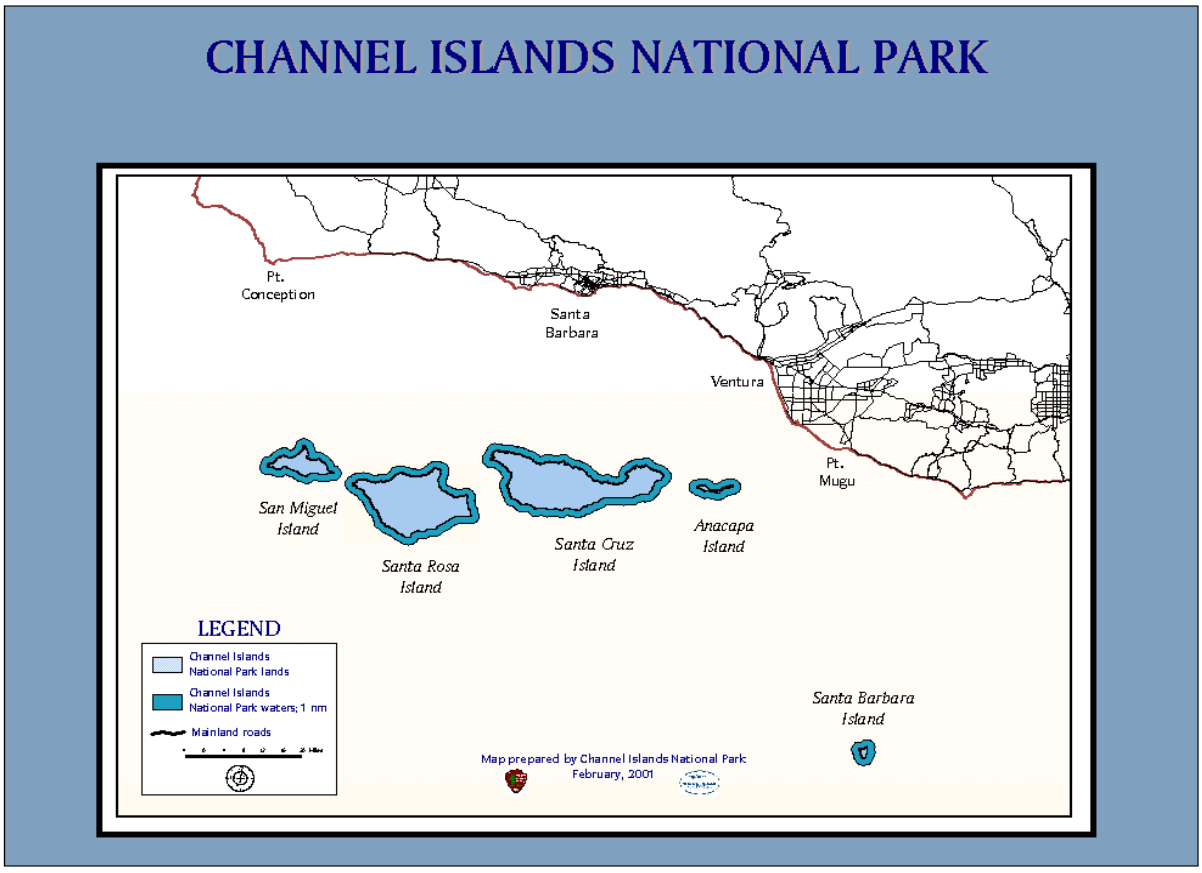

Figure 1. Map of Channel Islands National Park.

MATERIALS AND METHODS

Study Area

The California Channel Islands comprise 8 islands located at various distances from the mainland in the Southern California Bight (Figure 1), of which 5 are included in Channel Islands National Park. The islands range in size from less than 300 ha (Anacapa and Santa Barbara) to over 25,000 ha (Santa Cruz). Of the park islands, Anacapa is closest to the mainland, being 22 km from the coast, whereas Santa Barbara lies 73 km from the mainland. The larger islands are topographically diverse and support a variety of vegetation habitat types ranging from annual grasslands to coastal scrub communities and oak and conifer woodlands (Halvorson et al. 1988). The landbird monitoring program samples populations in the major vegetation habitat types on Santa Barbara, East Anacapa, Santa Rosa and San Miguel Islands (Tables 1 and 2).

Landbird Monitoring Methods

Van Riper et al. (1988) identified 3 methods for monitoring landbird populations at Channel Islands National Park. First, species relative abundance was to be estimated annually during both breeding and non-breeding seasons via a line transect sampling method from the islands' trail systems. Second, landbird densities were to be estimated via line transect sampling and variable circular plots once every 5 years, with the intention of subsequently applying conversion factors to the annual relative abundance data to produce estimates of relative density. Third, intensive demographic observations were to be made throughout the breeding season of species selected as representative of various feeding guilds.

The first method, estimation of relative abundance from transect counts, has been the only method implemented at the park for the following reasons. First, the method of calibrating the annual relative abundance counts via variable circular plot density estimation has been found to be logistically unworkable and so has been abandoned (Mark Sogge, personal communication); simple annual line transect counts are sufficient to detect significant changes in avian species diversity and abundance (Sogge et al. 1989). Second, problems with the use of indicator species has rendered that approach untenable (Mark Sogge, personal communication), and thus, there are no plans to develop monitoring methods for such. And third, funding is inadequate to support periodic intensive studies. The recent program review (McEachern 2000) recommended demographic monitoring via the Monitoring Avian Productivity and Survival (MAPS) program (Desante 1992).

Line transect counts were conducted on the transect routes identified by van Riper et al. (1988) for Santa Barbara, East Anacapa, and San Miguel Islands (Table 1, Figures 2–4), with the exception of Elephant Seal Cove Trail on Santa Barbara Island which is near a large Western Gull (*Larus occidentalis*) colony on Webster Point. Vocalizations by gulls made it impossible to detect landbird calls and songs during the spring; therefore, that transect was surveyed only in the fall. In 1993, an additional transect route was added on San Miguel (Nidever Canyon) in order to sample the *Coreopsis* scrub habitat in that canyon.

Super et al. (1991) established 11 point count transects and 4 line transects for monitoring landbirds on Santa Rosa Island (Figure 5).

Transects were surveyed in both breeding (March–April) and non-breeding (October–November) seasons (Table 3). Spring surveys were conducted between 5 March and 19 May; fall surveys were conducted between 28 September and 13 November. Transects were surveyed once each season. Line transect survey techniques used were those prescribed by van Riper et al. (1988). The observer recorded all landbird species detected, by visual or audio cue, within 100 m of the transect midline while walking the transect at the prescribed time of day and at wind speeds less than 10 knots. Point count survey techniques used were those identified by Super et al. (1991). After arriving at a point count location, the observer waited for at least one minute before starting the count. The observer

then recorded the distance of all birds detected within a 50 m radius for a 10-minute period. The distance of birds farther than the 50 m radius were also recorded.

Table 1. Landbird line transects surveyed at Channel Islands National Park from 1995 to 2000 (habitat types are plant community types described in Halvorson et al. 1988 and Clark et al. 1990).

Island	Transect	Length (km)	Vegetation Habitat Types	Route
Santa Barbara	Canyons	2.5	Coreopsis Scrub Wild Oats Boxthorn Scrub Maritime Cactus Scrub	Starts in Landing Cove Canyon and proceeds through Cave, Middle and Graveyard Canyons to the large Coreopsis stand east of Signal Peak.
	Arch Point Loop	5.4	Wild Oats Sea Cliff Scrub Coastal Sage Scrub	Starts at the island residence, proceeds up to the Saddle between North and Signal Peaks, follows the upper east slope of North Peak out to Arch Point, and returns to the residence via Cliff Canyon.
	Elephant Seal Cove Trail	1.5	Wild Oats Sea-blite Scrub Coastal Sage Scrub	Starts at the Saddle, proceeds west down across Webster Point to Elephant Seal overlook.
	Signal Peak	6.25	Wild Oats Sea Cliff Scrub Coastal Sage Scrub	Proceeds from the Saddle to Signal Peak, east through Cat Canyon, and across the Badlands.
East Anacapa	Trails	3.5	Coreopsis Scrub Annual Iceplant Coastal Sage Scrub	Starts at the lighthouse gate, proceeds past the bunkhouse and helicopter pad to the campground, on to Inspiration Point, and returns to residence via Cathedral Cove trail.
San Miguel	San Miguel Hill	2.3	Coreopsis Scrub Wild Oats Coastal Sage Scrub Caliche Scrub Haplopappus Scrub	Starts at Nidever Canyon residence and proceeds up past airstrip to San Miguel Hill.
	Dry Lakebed	5.4	Wild Oats Coastal Sage Scrub Caliche Scrub Haplopappus Scrub Lupine Scrub	Proceeds along Cross-Island Trail from San Miguel Hill over Green Mountain to Dry Lakebed.
	Harris Point	1.6	Lupine Scrub Haplopappus Scrub	Proceeds from junction of Harris Point trail and jeep trail 1.6 km north.
	Willow Canyon	3.0	Coreopsis Scrub Coastal Sage Scrub Haplopappus Scrub	Proceeds down Willow Canyon to Willow Cove.
	Nidever Canyon	1.4	Coreopsis Scrub	Proceeds from the mouth of Nidever Canyon to the junction with the campground trail.

Table 2. Landbird point count transects surveyed at Channel Islands National Park from 1995 to 2000 (habitat types are from Halvorson et al. 1988 and Clark et al. 1990).

Island	Transect	No. of Stations	Vegetation Habitat Types	Route
Santa Rosa	Lobo Canyon	20	Riparian	10 stations are located upstream and 10 downstream from where the road crosses the canyon.
	Torrey Pines	10	Torrey Pine Woodland	The 10 stations are located primarily on the east-west ridges that finger into the Torrey pine grove above Beecher's Bay.
	Woodland	12	Mixed Woodland	Located west of Black Mountain.
	Island Oaks	10	Island Oak Woodland	7 stations are located in the island oak groves on Black Mountain; an additional 3 are located in the Soledad groves.
	Cherry Canyon	5	Chaparral	Located at the head of Cherry Canyon.

Table 3. Survey dates for landbird transects, 1993 to 2000.

Isl	Site	Type	1993 S	1993 F	1994 S	1994 F	1995 S	1996 S	1996 F	1997 S	1997 F	1998 S	1998 F	1999 S	2000 S
AI	Trails	TL	Mar-31	Nov-06	Apr-13	Oct-05	—	Mar-21	Oct-09	Apr-16	Nov-06	Mar-20	—	—	Mar-23
SB	Arch Point	TL	Mar-05	—	Mar-18	Sep-30	Mar-18	Mar-27	Oct-16	Mar-19	Oct-29	Apr-09	Nov-13	—	May-19
SB	Canyons	TL	Mar-15	Oct-14	Mar-16	Sep-28	Mar-17	Mar-29	Oct-18	Mar-21	Oct-31	Apr-13	—	—	May-17
SB	SGNL	TL	Mar-13	Oct-12	Mar-17	Sep-29	Mar-18	Mar-30	Oct-17	Mar-20	Oct-30	Apr-10	Nov-12	—	May-18
SR	Cherry Canyon	TP	—	—	—	—	—	—	Nov-06	Apr-10	Oct-23	Apr-23	—	—	May-02
SR	Island Oaks	TP	—	—	—	Oct-28	—	Apr-04	Nov-08	—	Oct-24	Apr-24	—	—	—
SR	Lobo Canyon	TP	—	—	Apr-17	Oct-26	May-04	Apr-03	Nov-06	Apr-11	Oct-22	Apr-23	—	—	May-01
SR	Torrey Pines	TP	—	—	Apr-17	Oct-27	—	—	Nov-07	—	—	—	—	—	Apr-30
SR	Woodland	TP	—	—	—	—	—	—	Nov-06	Apr-10	Oct-23	Apr-23	—	—	May-02
SM	Harris Point	TL	Apr-08	—	Apr-29	Oct-14	Apr-07	Apr-26	Oct-31	Apr-04	Oct-14	Apr-17	—	Apr-08	Mar-31
SM	Dry Lakebed	TL	Apr-29	—	Apr-28	—	Apr-06	—	—	Apr-02	Oct-15	Apr-15	Oct-27	Apr-24	Apr-27
SM	Nidever Canyon	TL	Apr-09	—	Apr-29	Oct-14	Apr-07	Apr-26	Oct-31	Apr-04	Oct-14	Apr-17	Oct-26	Apr-08	Mar-30
SM	San Miguel Hill	TL	Apr-29	—	Apr-28	Oct-13	Apr-06	—	Oct-30	Apr-02	Oct-15	Apr-15	Oct-27	Apr-24	Apr-27
SM	Willow Canyon	TL	Apr-28	—	Apr-27	Oct-12	Apr-05	Apr-24	Nov-01	Apr-03	Oct-16	Apr-16	Oct-25	Apr-25	Mar-29

Isl = Island: AI = Anacapa Island, SB = Santa Barbara Island, SR = Santa Rosa Island, SM = San Miguel Island

Type: TL = line transect, TP = point count transect

S = spring, F = Fall

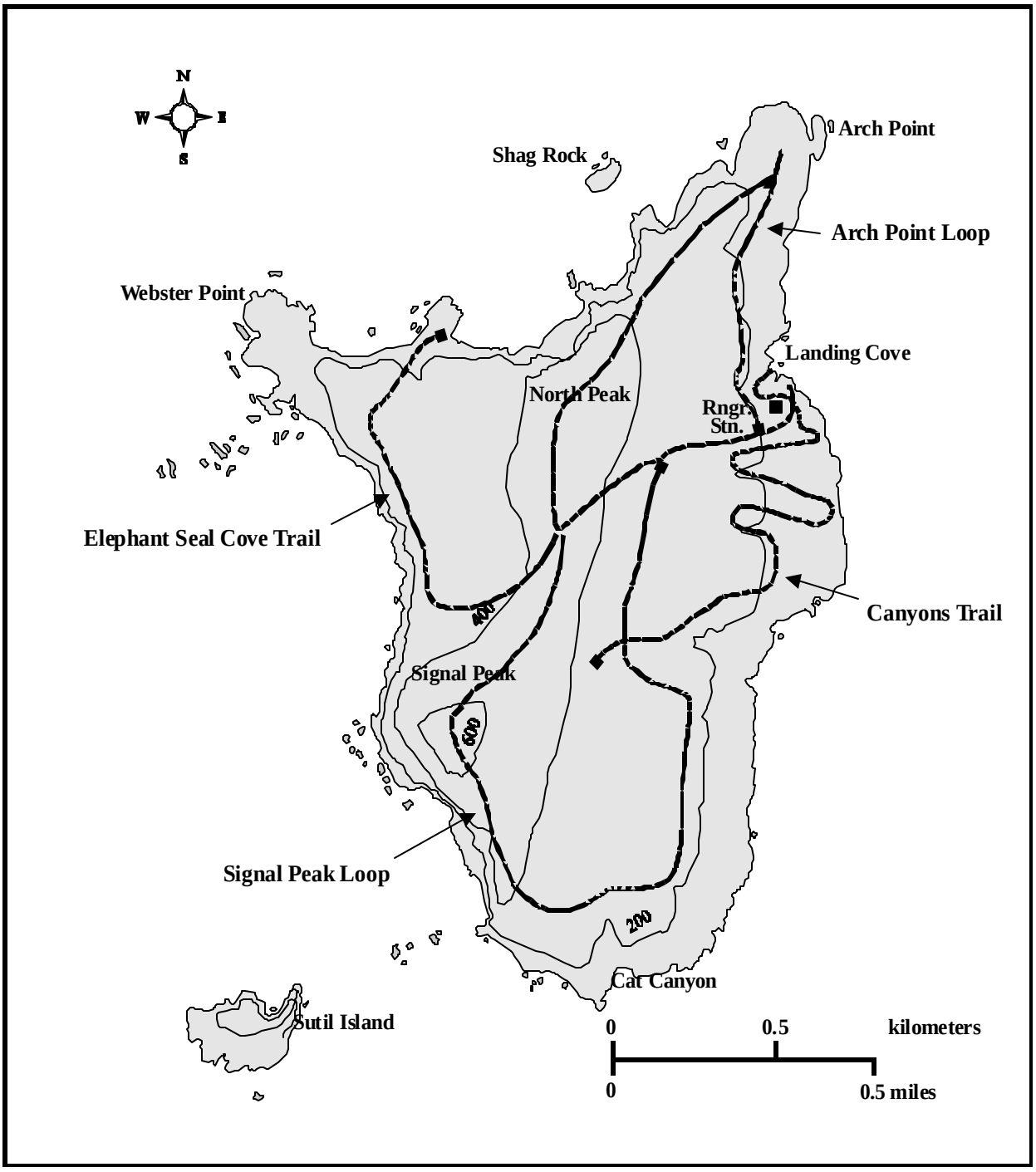

Figure 2. Landbird transect locations, Santa Barbara Island, Channel Islands National Park.

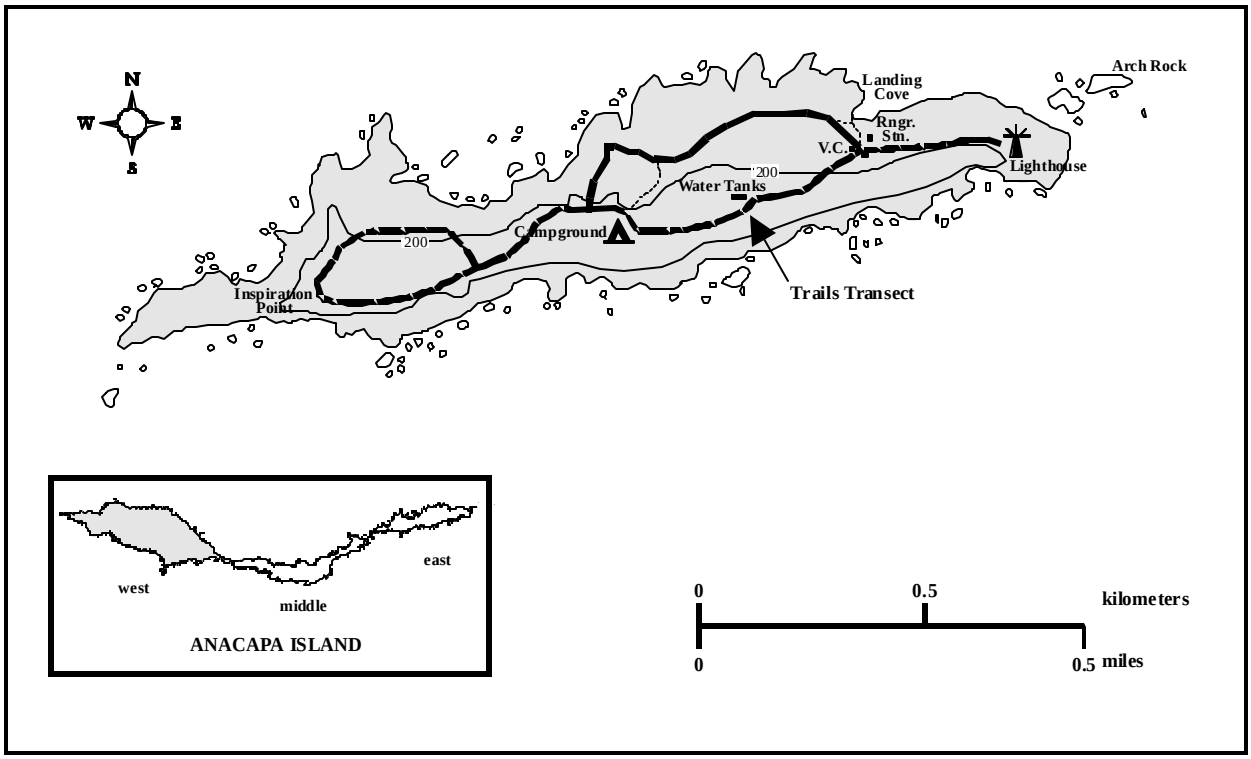

Figure 3. Landbird transects, East Anacapa Island, Channel Islands National Park.

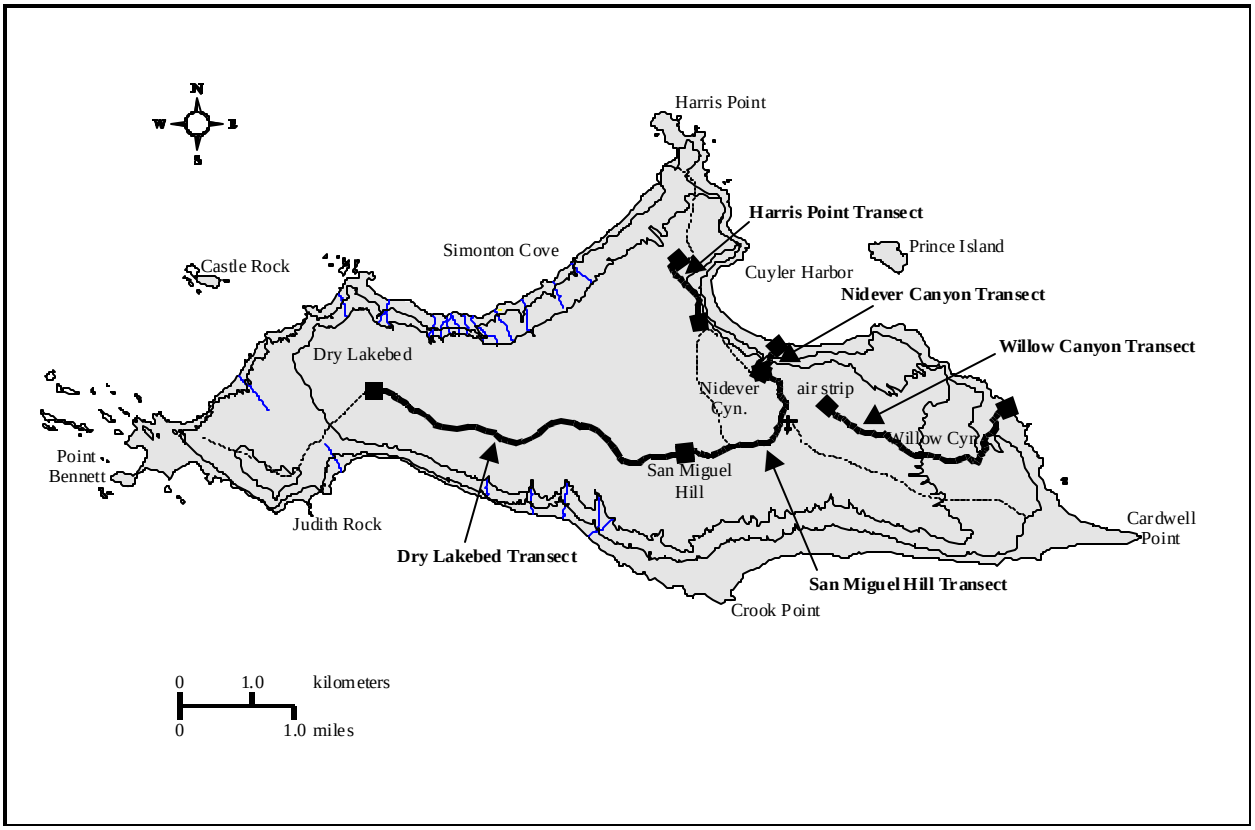

Figure 4. Landbird transect locations, San Miguel Island, Channel Islands National Park.

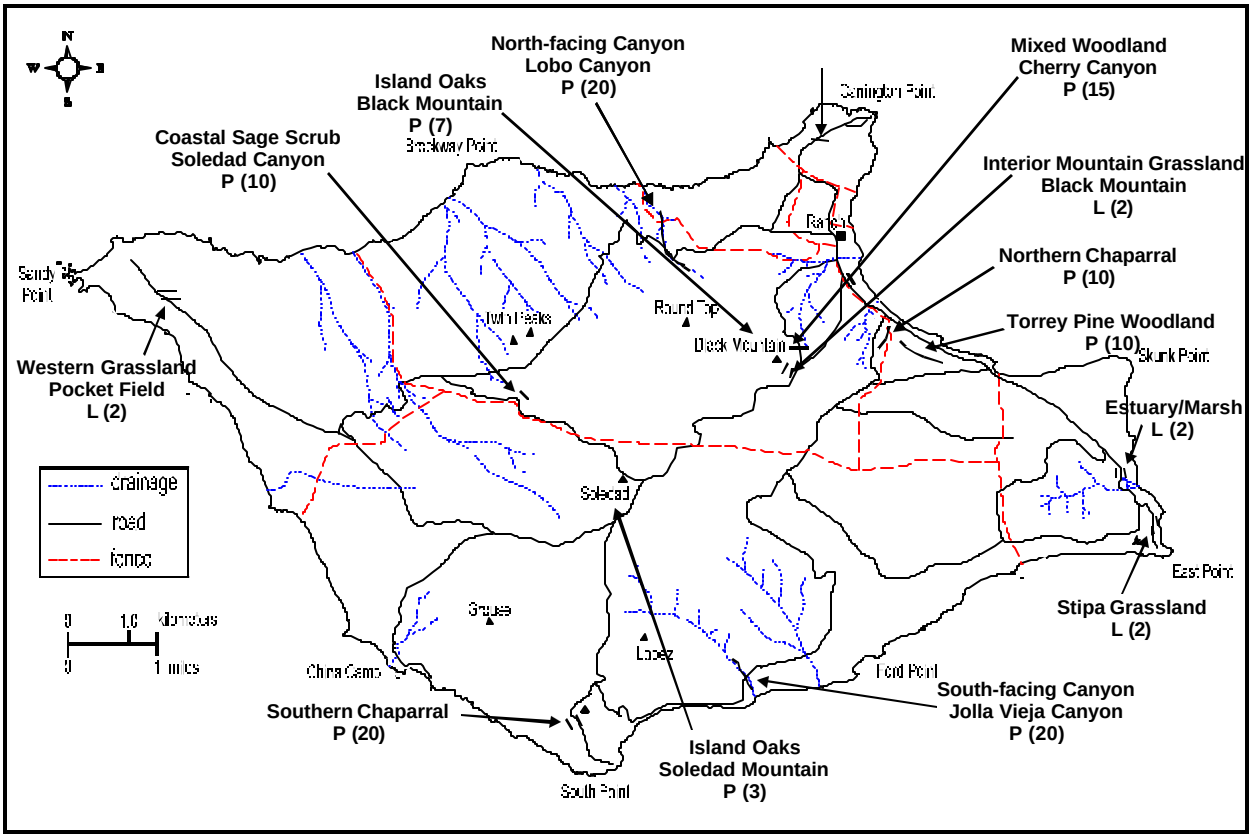

Figure 5. Landbird monitoring sites, Santa Rosa Island, Channel Islands National Park (LT = land transect, PC = point count).

RESULTS AND DISCUSSION

A total of 58 species was observed during the spring, and a total of 70 species was observed in the fall landbird surveys on Santa Barbara, East Anacapa, Santa Rosa and San Miguel Islands (Table 4). The number of species observed on each island varied annually (Table 5) primarily due to unequal sampling effort and interannual variation in migrants.

A total of 50 species of birds were recorded from 1993 to 2000 on Santa Barbara Island. The number of landbird species observed on Santa Barbara Island varied from 7 to 23 in the spring and from 15 to 26 in the fall between 1993 and 2000 (Table 5). With the exception of Rock Wrens, all landbird species known to breed regularly on Santa Barbara (Diamond and Jones 1980) and observed in 1993 and 1994 were observed in 1995 –1997. Rock Wrens (*Salpinctes obsoletus*) are resident breeders but were only detected in low numbers in 1995 and 1996 and were not detected in 1997 and 1998. Rock Wrens occupy habitat (rocky cliff-slopes) which is not surveyed adequately by the existing transects. As in 1993–1994, neither spring nor fall surveys recorded Barn Swallows (*Hirundo rustica*), a regular breeder which arrives after the spring survey period and departs prior to the fall survey period (Sogge et. al 1989). The Loggerhead Shrike (*Lanius ludovicianus*), which Diamond and Jones identified as an occasional breeder on Santa Barbara, was only observed during the fall of 1994. House Finches (*Carpodacus mexicanus*), listed as no longer breeding on Santa Barbara Island, were detected in small numbers in 1995, 1996, and 1997. Barn Owls (*Tyto alba*), a resident breeder not observed in 1993 or 1994, were observed in 1995–1998 and 2000.

A total of 30 species of birds were recorded from 1993 to 2000 on East Anacapa Island. The number of landbird species observed on Anacapa Island varied from 4 to 14 in the spring and from 14 to 17 in the fall between 1993 and 2000 (Table 5). Some species known to breed on Anacapa Island (Diamond and Jones 1980) were not observed annually. Chipping Sparrow (*Spizella passerina*) and Allen's Hummingbird (*Selasphorus sasin*) are regular breeders on Anacapa but were only observed during the surveys in the spring of 1998 and in the fall of 1996 (respectively). The Common Raven (*Corvus corax*) is listed as an occasional breeder and was observed in both spring and fall. The Barn Owl, White-throated Swift, (*Aeronautes saxatalis*) and Pacific Slope Flycatcher (*Empidonax difficilis*) were reported as regular breeders on Anacapa by Diamond and Jones but were not recorded on East Anacapa in any of the years probably due to lack of suitable habitat for these species on East Anacapa. Similarly, the Mourning Dove (*Zenaida macroura*), Northern Mockingbird (*Mimus polyglottos*), Loggerhead Shrike, Hutton's Vireo (*Vireo huttoni*) and Rufous-crowned Sparrow (*Aimophila ruficeps*) were listed as occasional breeders on Anacapa but were not recorded. It is possible that these species, which were not detected on the East Anacapa transects, bred on Middle or West Anacapa Island during the survey period.

A total of 57 species of birds were recorded from 1993 to 2000 on Santa Rosa Island. The number of landbird species observed on Santa Rosa Island varied from 19 to 28 in the spring and from 17 to 39 in the fall between 1993 and 2000 (Table 5). Santa Rosa has a richer avifauna than the smaller islands due to its larger size, greater topographic diversity, and greater number of vegetation types. Only 5 habitat types were surveyed on Santa Rosa (riparian, Torrey pine woodland, island oak woodland, mixed woodland, and chaparral). Regular breeders (Super et al. 1991) not observed during the surveys from 1993 to 2000 include Killdeer, *Charadrius vociferus* (only observed in fall of 1994), Burrowing Owl (*Athene cunicularia*), White-throated Swift (only observed in spring of 1996 and 2000), and Horned Lark, *Eremophila alpestris* (only observed in spring of 2000 and fall of 1994). Regular breeders Northern Mockingbird, Loggerhead Shrike, and Hutton's Vireo were observed in very low numbers. Species richness (the number of species observed) was greatest for riparian transects in all years (Table 6). Whereas riparian habit is generally richer in bird abundance and diversity, this may also reflect the fact that there are more point count sites in riparian habitat (20) than in the others (5-12).

A total of 48 species of birds were recorded from 1993 to 2000 on San Miguel Island. The number of landbird species observed on San Miguel Island varied from 11 to 18 in the spring and from 20 to 28 in the fall between 1993 and 2000 (Table 5). All species listed as regular breeders by Diamond and Jones were observed during the study period with the exception of the Barn Owl which was only observed in the spring of 2000. The Loggerhead Shrike, listed as an occasional breeder, was not observed. The Lesser Goldfinch (*Carduelis psaltria*), another occasional breeder, was observed in low numbers, and not every year. The Red-tailed Hawk (*Buteo jamaicensis*), an occasional breeder, was observed every year except the spring of 1996 and 1999.

The Landbird Program Review Team recommended that future results incorporate v functions based on distance to bird measurements. The majority of the data to date has been collected by two observers. Future monitoring will incorporate use of monitoring personnel in a manner that suits the detectability methods. Data from line transects do not lend themselves well to statistical analysis since the transects are not standardized, are not stratified by habitat, and there are no replicates. For the more common species, however, it is possible to compare data among transects and years by calculating the number of individuals observed per km Tables 7–10. After the recommended program revisions (McEachern 2000) are incorporated, detectability values will be estimated for later reports.

Because the Santa Rosa point count transects are stratified by habitat, relative abundance was estimated for each species by habitat type (Tables 11–15). In riparian habitat, the most abundant species (occurring at all sampling dates in descending order of abundance) were Bewick's Wren, House Finch, Song Sparrow, Spotted Towhee, Orange-crowned Warbler, and Black Phoebe. Other commonly occurring species were Western Meadowlark, Rock Wren, and Common Raven.

Breeding bird use of the other habitat types was less consistent, perhaps indicating their marginal value as breeding habitat. Bewick's Wren was the only species observed in significant numbers and consistently throughout the other habitat types (oak woodland, mixed woodland, chaparral, and Torrey pine woodland). In oak woodland (Table 12), House Finches, Orange-crowned Warblers, Spotted Towhees, and Song Sparrows were observed in considerable numbers, but not every year. In mixed woodland and chaparral, House Finches and Spotted Towhees were observed consistently every year (Tables 13 and 14); Song Sparrows were also observed every year in chaparral. In the Torrey pines (Table 15), House Finches and Spotted Towhees were observed consistently every year.

The Inventory and Monitoring Program plant communities identified by Halvorson et al (1988) may not correspond directly to habitats as utilized by birds.

The actual landbird monitoring data by transect or point count station for each sampling date is shown in Appendix A, Tables 16–30.

Table 4. Species observed during landbird surveys, Channel Islands National Park, 1995–2000.

Nomenclature is from American Ornithologists Union 1983, 1997.

Common Name	*Latin Name*	1993	1994	1995	1996	1997	1998	1999	2000
Double-crested Cormorant	*Phalacrocorax auritus*	—	R	—	—	—	—	—	—
Brandt's Cormorant	*Phalacrocorax penicillatus*	—	—	—	—	—	M	—	—
Great Blue Heron	*Ardea herodias*	—	R	—	—	—	—	—	—
American Wigeon	*Anas americana*	—	R	—	—	—	—	—	—
Green-winged Teal	*Anas crecca*	—	R	—	—	—	—	—	—
Mallard	*Anas platyrhynchos*	—	—	—	—	—	—	—	R
Ruddy Duck	*Oxyura jamaicensis*	—	R	—	—	—	—	—	—
Cooper's Hawk	*Accipiter cooperii*	—	A	—	M	—	—	—	—
Sharp-shinned Hawk	*Accipiter striatus*	—	R	—	—	—	—	M	—
Golden Eagle	*Aquila chrysaetos*	—	R	—	—	—	—	—	—
Red-tailed Hawk	*Buteo jamaicensis*	M	A, M, R	B, M, R	A, M, R	A, M, R	A, M, R	—	M, R
Rough-legged Hawk	*Buteo lagopus*	—	M	—	—	—	—	—	—
Red-shouldered Hawk	*Buteo lineatus*	B	—	—	—	—	—	—	—
Northern Harrier	*Circus cyaneus*	B	B, M	B, M	B, M	B, M	B, M	—	M
White-tailed Kite	*Elanus leucurus*	—	—	—	—	B	—	—	—
Merlin	*Falco columbarius*	—	—	B	B, R	B, M	B	—	—
Peregrine Falcon	*Falco peregrinus*	A, M	A, B	B, M	B, M	A, B, M, R	A, B, R	M	R
American Kestrel	*Falco sparverius*	A, B, M	A, B, R	B, R	A, B, R	A, B, M, R	B, M, R	M	A, M, R
California Quail	*Callipepla californica*	—	R	R	R	R	R	—	R
Killdeer	*Charadrius vociferus*	—	R	—	B	—	—	—	—
Black-bellied Plover	*Pluvialis squatarola*	—	M	—	—	—	—	—	—
Spotted Sandpiper	*Actitis macularia*	—	R	—	—	—	—	—	—
Sanderling	*Calidris alba*	—	R	—	—	—	—	—	—
Least Sandpiper	*Calidris minutilla*	—	R	—	—	—	—	—	—
Mourning Dove	*Zenaida macroura*	—	B, R	R	R	M, R	R	—	R
Barn Owl	*Tyto alba*	—	—	B	B	B	B	—	B, M
Short-eared Owl	*Asio flammeus*	B	B	B	B	B	—	—	—
Long-eared Owl	*Asio otus*	—	—	B	—	—	—	—	—
Burrowing Owl	*Athene cunicularia*	B	B, M	B, M	A, B	M	M	—	—
White-throated Swift	*Aeronautes saxatalis*	—	—	—	R	—	—	—	R
Anna's Hummingbird	*Calypte anna*	—	M, R	M, R	A, B, M, R	R	R	—	R
Allen's Hummingbird	*Selasphorus sasin*	M	M, R	B, M	B, M, R	M, R	M, R	M	M, R
Northern Flicker	*Colaptes auratus*	B	R	—	M, R	M, R	M	—	—
Acorn Woodpecker	*Melanerpes formicivorus*	—	—	—	R	—	—	—	—
Yellow-bellied Sapsucker	*Sphyrapicus varius*	—	—	—	M	—	—	—	—
Pacific-slope Flycatcher	*Empidonax difficilis*	—	R	R	M	R	R	—	R
Black Phoebe	*Sayornis nigricans*	—	A, M, R	R	A, B, M, R	A, B, R	A, M, R	—	R
Say's Phoebe	*Sayornis saya*	A, B, M	A, B, M, R	B	A, B, M, R	A, B, M, R	B, M	—	M, R
Western Kingbird	*Tyrannus verticalis*	A	—	—	—	—	A	—	—
Horned Lark	*Eremophila alpestris*	B, M	B, M, R	B, M	B, M	A, B, M	B, M	M	B, M, R
Cliff Swallow	*Petrochelidon pyrrhonota*	B	B	—	—	—	—	—	—
Barn Swallow	*Hirundo rustica*	A	A, M, R	M, R	A, M, R	A, M	A	—	R

Common Name	*Latin Name*	1993	1994	1995	1996	1997	1998	1999	2000
Common Raven	*Corvus corax*	A, M	A, M, R	M, R	A, M, R	M, R	M, R	M	M, R
Red-breasted Nuthatch	*Sitta canadensis*	—	—	—	B, R	—	—	—	—
Rock Wren	*Salpinctes obsoletus*	B, M	A, B, M, R	B, M, R	A, B, M, R	A, M, R	B, M, R	M	B, M, R
Bewick's Wren	*Thryomanes bewickii*	A, M	A, R	R	A, M, R	A, B, M, R	A, M, R	—	A, M, R
House Wren	*Troglodytes aedon*	A	A, R	—	A, B, M, R	A, B, R	B, M	—	R
Blue-gray Gnatcatcher	*Polioptila caerulea*	—	B	—	—	—	—	—	—
Ruby-crowned Kinglet	*Regulus calendula*	—	B, M, R	—	B, M, R	B, M, R	B	—	R
Hermit Thrush	*Catharus guttatus*	B	R	—	B, M, R	M	B, M	—	—
Varied Thrush	*Ixoreus naevius*	—	R	B	M	—	—	—	R
Townsend's Solitaire	*Myadestes townsendi*	—	—	—	—	—	B	—	—
Mountain Bluebird	*Sialia currucoides*	—	—	—	—	B	B	—	—
American Robin	*Turdus migratorius*	—	R	—	M, R	—	—	—	—
Northern Mockingbird	*Mimus polyglottos*	—	—	R	R	B	—	—	—
Loggerhead Shrike	*Lanius ludovicianus*	—	B, R	—	R	—	R	—	R
European Starling	*Sturnus vulgaris*	A, B	B, M	B, M, R	A, B, M, R	A, B, M, R	A, M, R	M	—
Hutton's Vireo	*Vireo huttoni*	—	—	—	R	—	M, R	—	—
Yellow-rumped Warbler	*Dendroica coronata*	A, B	A, B, M, R	B	A, B, M, R	B, M	B, M	—	—
Black-throated Gray Warbler	*Dendroica nigrescens*	B	—	—	—	—	—	—	—
Hermit Warbler	*Dendroica occidentalis*	—	—	—	—	—	R	—	—
Palm Warbler	*Dendroica palmarum*	A	—	—	—	—	—	—	—
Yellow Warbler	*Dendroica petechia*	—	—	—	—	M	—	—	—
Townsend's Warbler	*Dendroica townsendi*	—	R	—	R	—	R	—	B
Common Yellowthroat	*Geothlypis trichas*	A	—	—	A, M, R	M	M	—	—
Orange-crowned Warbler	*Vermivora celata*	A, B, M	A, B, M, R	B, M, R	A, B, M, R	A, B, M, R	A, B, M, R	M	A, B, M, R
Wilson's Warbler	*Wilsonia pusilla*	—	—	B	R	—	—	—	B
Rufous-crowned Sparrow	*Aimophila ruficeps*	—	—	—	A	—	—	—	—
Lark Sparrow	*Chondestes grammacus*	B	—	—	—	—	—	—	—
Dark-eyed Junco	*Junco hyemalis*	—	B, R	—	B, R	B	B, M	—	—
Song Sparrow	*Melospiza melodia*	M	M, R	B, M, R	M, R	M, R	M, R	M	M, R
Savannah Sparrow	*Passerculus sandwichensis*	A, B, M	A, B	B	A, B	A, B	A, B	—	—
Fox Sparrow	*Passerella iliaca*	—	—	—	—	—	M	—	—
Spotted Towhee	*Pipilo maculatus*	A	A, B, R	R	B, R	B, R	R	—	R
Chipping Sparrow	*Spizella passerina*	B	B, R	R	R	M, R	A, B, R	—	R
Golden-crowned Sparrow	*Zonotrichia atricapilla*	A, M	M, R	M	A, B, M	B, M, R	B, M	—	—
White-crowned Sparrow	*Zonotrichia leucophrys*	A, B, M	A, B, M, R	B, M	A, B, M, R	A, B, M, R	A, B, M	M	A, M
Brewer's Blackbird	*Euphagus cyanocephalus*	B	A	—	B	M	—	—	—
Hooded Oriole	*Icterus cucullatus*	—	—	—	M	—	—	—	—
Western Meadowlark	*Sturnella neglecta*	A, B, M	A, B, M, R	B, M, R	A, B, M, R	A, B, M, R	A, B, M, R	M	B, M, R
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	—	—	—	—	A	—	—	—
Lesser Goldfinch	*Carduelis psaltria*	M	R	—	R	M, R	—	—	R
American Goldfinch	*Carduelis tristis*	—	—	—	—	—	B	—	—
House Finch	*Carpodacus mexicanus*	A, M	A, M, R	B, M, R	A, B, M, R	A, B, M, R	A, M, R	M	M, R

Table 5. Number of landbird species observed, 1993 to 2000.

Island	1993	1994	1995	1996	1997	1998	1999	2000
Anacapa	19	19	—	21	17	13	—	4
San Miguel	17	22	17	31	30	27	13	15
Santa Barbara	21	22	23	29	25	22	—	7
Santa Rosa	—	44	19	38	26	23	—	28
Park-wide	36	56	35	54	44	46	13	33

Table 6. Species richness by habitat type for point count transects, Santa Rosa Island.

Description	1994	1995	1996	1997	1998	2000	Total Unique Species All Years
Island Chaparral	—	—	11	17	11	12	22
Island Oak	16	—	19	11	10	—	28
Marsh	16	—	—	—	—	—	16
Mixed Woodland	—	—	13	19	11	13	28
Riparian	30	19	30	24	20	27	39
Torrey Pine	17	—	16	—	—	15	27
Total Unique Species All Habitats	44	19	38	26	23	28	—

Table 7. Relative abundance of Horned Larks from spring line transect surveys, 1993–2000. Values are number of birds observed per km.

Island	Site	1993	1994	1995	1996	1997	1998	1999	2000
Santa Barbara	Arch Point Loop	11.71	2.57	7.14	6.00	4.86	2.00	—	7.71
Santa Barbara	Signal Peak Loop	4.10	4.36	9.23	5.90	3.85	2.82	—	8.97
Santa Barbara	Canyons	—	—	—	1.36	—	—	—	4.09
San Miguel	Willow Canyon	—	—	—	0.33	—	0.33	—	—
San Miguel	San Miguel Hill	14.78	12.61	3.91	—	4.35	1.30	1.74	3.48
San Miguel	Harris Point	5.00	5.00	5.62	8.12	3.12	1.25	1.25	1.87
San Miguel	Dry Lakebed	17.41	10.74	5.74	—	2.22	1.85	5.93	3.33

Table 8. Relative abundance of Western Meadowlarks from spring line transect surveys, 1993–2000. Values are number of birds per km.

Island	Site	1993	1994	1995	1996	1997	1998	1999	2000
Santa Barbara	Arch Point Loop	8.00	7.71	12.57	6.57	4.00	4.57	—	8.29
Santa Barbara	Canyons	6.36	15.91	9.09	5.00	5.00	6.36	—	8.64
Santa Barbara	Signal Peak Loop	8.97	11.28	17.44	7.95	4.62	4.10	—	2.82
Anacapa	East Anacapa	4.86	1.43	—	9.71	2.86	3.71	—	—
San Miguel	Harris Point	4.37	0.62	1.25	1.25	3.75	1.25	3.75	5.00
San Miguel	Dry Lakebed	4.63	5.56	7.78	—	4.81	3.89	9.07	3.52
San Miguel	San Miguel Hill	1.74	5.22	2.17	—	2.17	4.35	10.00	0.87
San Miguel	Willow Canyon	1.00	1.33	1.33	0.67	0.67	1.00	—	0.33

Table 9. Relative abundance of Orange-crowned Warblers from spring line transect surveys, 1994–2000. Values are number of birds per km.

Island	Site	1993	1994	1995	1996	1997	1998	1999	2000
Santa Barbara	Arch Point Loop	0.29	—	0.29	0.86	0.57	1.14	—	1.43
Santa Barbara	Canyons	8.64	5.00	4.55	3.18	4.09	1.36	—	18.18
Anacapa	East Anacapa	4.57	4.29	—	2.86	6.29	1.71	—	5.43
San Miguel	Dry Lakebed	0.19	—	0.93	—	0.56	0.56	0.19	0.19
San Miguel	Harris Point	1.25	0.62	3.12	—	0.62	0.62	2.50	11.87
San Miguel	Nidever Canyon	7.14	6.43	10.71	6.43	2.86	2.86	4.29	9.29
San Miguel	San Miguel Hill	2.17	3.04	2.61	—	—	0.87	2.61	6.96
San Miguel	Willow Canyon	6.33	11.67	5.33	5.00	5.00	3.33	12.33	14.33

Table 10. Relative abundance of Song Sparrows from spring line transect surveys, 1994–2000, San Miguel Island. Values are number of birds per km.

Island	Site	1993	1994	1995	1996	1997	1998	1999	2000
San Miguel	Dry Lakebed	3.52	5.19	3.52	—	3.89	3.33	8.52	0.93
San Miguel	Harris Point	15.00	10.00	12.50	10.00	10.62	9.37	10.62	6.87
San Miguel	Nidever Canyon	18.57	6.43	11.43	9.29	10.71	7.86	10.00	7.86
San Miguel	San Miguel Hill	8.26	12.17	5.65	—	2.17	3.48	10.00	11.30
San Miguel	Willow Canyon	22.33	21.00	21.00	6.00	13.33	7.33	18.67	8.00

Table 11. Relative abundance of birds observed on point counts in riparian habitat, Santa Rosa Island, 1994–2000. Values are number of birds observed per 10 point count stations.

Common Name	1994 S	1994 F	1995 S	1996 S	1996 F	1997 S	1997 F	1998 S	2000 S
Mallard	—	—	—	—	—	—	—	—	.50
Red-tailed Hawk	0.50	—	—	—	0.67	2.22	—	0.71	3.00
Peregrine Falcon	—	—	—	—	—	—	—	—	.50
American Kestrel	3.50	2.00	2.50	3.57	1.33	4.44	0.63	2.86	2.00
California Quail	4.00	—	3.00	—	—	3.33	9.38	1.43	0.50
Mourning Dove	1.00	—	1.00	2.86	—	6.67	—	2.86	—
White-throated Swift	—	—	—	2.86	—	—	—	—	1.50
Anna's Hummingbird	—	0.50	1.00	0.71	0.67	—	—	0.71	1.00
Allen's Hummingbird	3.50	2.00	—	0.71	—	1.11	—	0.71	8.00
Northern Flicker	—	—	—	—	0.67	—	0.63	—	—
Pacific-slope Flycatcher	8.50	—	14.00	—	—	4.44	—	4.29	8.00
Black Phoebe	1.00	4.00	4.50	3.57	5.33	1.11	5.00	8.57	2.00
Say's Phoebe	—	1.00	—	—	—	—	—	—	0.50
Horned Lark	—	31.00	—	—	—	—	—	—	.50
Barn Swallow	—	—	1.00	5.00	—	—	—	—	1.50
Common Raven	1.50	1.00	1.00	2.14	—	—	1.25	1.43	5.00
Rock Wren	1.00	1.00	0.50	0.71	1.33	—	0.63	4.29	3.00
Bewick's Wren	15.50	8.50	10.00	9.29	8.67	12.22	19.38	11.43	9.00
House Wren	—	1.50	—	—	4.00	—	0.63	—	0.50
Ruby-crowned Kinglet	—	8.50	—	2.86	12.00	—	7.50	—	0.50
Hermit Thrush	—	0.50	—	—	5.33	—	—	—	—
Varied Thrush	—	0.50	—	—	—	—	—	—	0.50
Northern Mockingbird	—	—	0.50	—	0.67	—	—	—	—
Loggerhead Shrike	1.00	1.00	—	—	—	—	—	2.14	1.00
European Starling	—	—	4.50	0.71	3.33	—	—	1.43	—
Hutton's Vireo	—	—	—	—	3.33	—	—	—	—
Yellow-rumped Warbler	0.50	0.50	—	—	—	—	—	—	—
Common Yellowthroat	—	—	—	—	3.33	—	—	—	—
Orange-crowned Warbler	10.50	5.50	5.00	6.43	5.33	7.78	0.63	4.29	7.50
Wilson's Warbler	—	—	—	2.14	—	—	—	—	—
Dark-eyed Junco	—	0.50	—	—	—	—	—	—	—
Song Sparrow	7.00	7.00	6.50	12.86	6.00	4.44	3.75	13.57	10.50
Spotted Towhee	7.00	5.00	9.00	4.29	6.00	5.56	8.75	4.29	8.00
Chipping Sparrow	10.50	—	3.50	3.57	—	10.00	—	5.71	5.50
Golden-crowned Sparrow	0.50	—	—	—	—	—	—	—	—
White-crowned Sparrow	0.50	3.50	—	—	6.67	—	1.25	—	—
Western Meadowlark	1.50	19.00	—	1.43	4.67	1.11	5.63	1.43	4.50
Lesser Goldfinch	—	2.00	—	2.14	—	4.44	—	—	2.00
House Finch	4.50	4.50	10.00	16.43	8.00	18.89	5.63	12.14	7.00

Table 12. Relative abundance of birds observed on point counts in oak woodland habitat, Santa Rosa Island, 1994–2000. Values are number of birds observed per 10 point count stations.

Common Name	1994 F	1996 S	1996 F	1997 F	1998 S
Sharp-shinned Hawk	1.11	—	—	—	—
American Kestrel	3.33	—	5.00	1.67	—
Anna's Hummingbird	—	—	—	—	1.43
Northern Flicker	—	—	—	3.33	—
Acorn Woodpecker	—	—	1.67	—	—
Pacific-slope Flycatcher	—	—	—	—	7.14
Black Phoebe	1.11	—	—	1.67	—
Say's Phoebe	—	—	3.33	3.33	—
Common Raven	—	5.71	—	8.33	2.86
Red-breasted Nuthatch	—	—	5.00	—	—
Rock Wren	—	—	—	3.33	—
Bewick's Wren	11.11	10.00	11.67	6.67	14.29
Ruby-crowned Kinglet	6.67	2.86	1.67	—	—
Hermit Thrush	1.11	—	—	—	—
Varied Thrush	1.11	—	—	—	—
American Robin	8.89	—	—	—	—
Yellow-rumped Warbler	13.33	—	8.33	—	—
Townsend's Warbler	1.11	—	3.33	—	—
Orange-crowned Warbler	2.22	8.57	1.67	—	4.29
Dark-eyed Junco	—	—	6.67	—	—
Song Sparrow	1.11	5.71	—	1.67	2.86
Spotted Towhee	2.22	2.86	—	3.33	5.71
Chipping Sparrow	—	5.71	—	—	7.14
White-crowned Sparrow	—	—	6.67	—	—
Western Meadowlark	—	10.00	—	3.33	1.43
Lesser Goldfinch	—	32.86	10.00	—	—
House Finch		32.86	10.00	8.33	11.43

Table 13. Relative abundance of birds observed on point counts in mixed woodland habitat, Santa Rosa Island, 1994–2000. Values are number of birds observed per 10 point count stations.

Common Name	1996 F	1997 S	1997 F	1998 S	2000 S
American Kestrel	2.22	—	—	1.00	—
California Quail	3.33	3.00	3.00	—	1.00
Mourning Dove	—	—	—	—	1.00
Anna's Hummingbird	—	2.00	—	—	—
Allen's Hummingbird	—	—	—	—	5.00
Northern Flicker	1.11	—	—	—	—
Pacific-slope Flycatcher	—	2.00	—	12.00	13.00
Black Phoebe	—	2.00	—	—	—
Say's Phoebe	1.11	—	3.00	—	—
Common Raven	2.22	1.00	—	—	—
Red-breasted Nuthatch	3.33	—	—	—	—
Rock Wren	2.22	—	1.00	—	—
Bewick's Wren	17.78	9.00	10.00	12.00	9.00
Ruby-crowned Kinglet	10.00	—	5.00	—	—
Hermit Thrush	10.00	—	—	—	—
American Robin	1.11	—	—	—	—
Hutton's Vireo	—	—	—	1.00	—
Hermit Warbler	—	—	—	1.00	—
Townsend's Warbler	—	—	—	1.00	—
Orange-crowned Warbler	—	7.00	—	4.00	4.00
Song Sparrow	—	2.00	2.00	—	1.00
Spotted Towhee	7.78	7.00	9.00	7.00	5.00
Chipping Sparrow	—	11.00	—	7.00	8.00
Golden-crowned Sparrow	—	1.00	—	—	—
Western Meadowlark	—	1.00	—	2.00	2.00
Lesser Goldfinch	—	1.00	—	—	—
House Finch	16.67	13.00	12.00	6.00	7.00

Table 14. Relative abundance of birds observed on point counts in chaparral habitat, Santa Rosa Island, 1994–2000. Values are number of birds observed per 10 point count stations.

Common Name	1996 F	1997 S	1997 F	1998 S	2000 S
American Kestrel	—	2.00	2.00	—	—
California Quail	—	4.00	—	2.00	6.00
Anna's Hummingbird	2.00	2.00	—	—	—
Allen's Hummingbird	—	—	—	—	4.00
Pacific-slope Flycatcher	—	2.00	—	10.00	10.00
Black Phoebe	—	2.00	—	—	—
Say's Phoebe	4.00	—	2.00	—	—
Horned Lark	—	—	—	—	2.00
Common Raven	2.00	—	6.00	—	—
Rock Wren	—	4.00	6.00	2.00	—
Bewick's Wren	10.00	8.00	2.00	10.00	10.00
Ruby-crowned Kinglet	4.00	—	—	—	—
Hermit Thrush	12.00	—	—	—	—
American Robin	2.00	—	—	—	—
Orange-crowned Warbler	—	6.00	—	4.00	6.00
Song Sparrow	2.00	6.00	6.00	4.00	4.00
Spotted Towhee	4.00	4.00	14.00	10.00	8.00
Chipping Sparrow	—	10.00	—	2.00	12.00
Golden-crowned Sparrow	—	2.00	—	—	—
Western Meadowlark	—	2.00	2.00	8.00	2.00
Lesser Goldfinch	—	4.00	—	—	—
House Finch	2.00	28.00	4.00	12.00	14.00

Table 15. Relative abundance of birds observed on point counts in Torrey pine habitat, Santa Rosa Island, 1994–2000. Values are number of birds observed per 10 point count stations.

Common Name	1994 S	1994 F	1996 F	2000 S
Red-tailed Hawk	1.00	—	—	1.00
Merlin	—	—	1.25	—
American Kestrel	—	1.00	1.25	—
California Quail	—	—	—	6.00
Anna's Hummingbird	—	—	—	9.00
Allen's Hummingbird	9.00	—	—	—
Northern Flicker	—	—	1.25	—
Pacific-slope Flycatcher	5.00	—	—	9.00
Black Phoebe	—	1.00	—	1.00
Horned Lark	—	—	—	2.00
Barn Swallow	3.00	—	—	3.00
Common Raven	—	1.00	2.50	2.00
Red-breasted Nuthatch	—	—	1.25	—
Bewick's Wren	8.00	9.00	7.50	14.00
Ruby-crowned Kinglet	—	2.00	1.25	—
Hermit Thrush	—	3.00	2.50	—
American Robin	—	—	2.50	—
European Starling	—	—	5.00	—
Yellow-rumped Warbler	—	13.00	2.50	—
Orange-crowned Warbler	1.00	—	—	6.00
Dark-eyed Junco	—	—	2.50	—
Song Sparrow	—	—	1.25	2.00
Spotted Towhee	—	8.00	3.75	1.00
Chipping Sparrow	18.00	—	—	12.00
Western Meadowlark	—	1.00	—	6.00
Lesser Goldfinch	1.00	—	7.50	—
House Finch	8.00	1.00	11.25	15.00

MANAGEMENT RECOMMENDATIONS

There are several problems with the current line-transect-based landbird monitoring program. First, the transects are not stratified by habitat type. The transects cross many habitat types and are not linked to any measure of habitat such as vegetation monitoring transects. As a result, landbird data cannot be grouped and compared by habitat type. Second, the simple count data generated by the program allow no estimate of error or variance. Moreover, the resolution of the methods is unknown. The level of population change that can be detected by these methods is unknown. Last, although the line transect methods used in this program work well in low vegetation types, they are not currently used in many other landbird monitoring programs, thus preventing comparison of Channel Islands data with that from other local and regional programs.

After 8 years of landbird monitoring, it was time to evaluate the program to determine its resolution and to reconsider the methods. The current line-transect-based program is of low resolution. As part of a programmatic review (McEachern 2000), statistical power of the program is being estimated. The Park will be replacing line transects with point counts. The point count method has been adopted as a standard method for monitoring landbirds (Ralph et. al 1993), and point count data are amenable to statistical inference. This allows the data to be stratified by habitat type, and data can be compared among habitat types and islands.

The review team also recommended that the park collect more detailed demographic data via a Constant Effort Mist-Netting (CEMN) procedure such as that used in the Mapping Avian Productivity and Survival (MAPS) program (DeSante 1992). Such a method would generate much more intensive data on reproductive parameters than would a simple line-transect or point count program. However, MAPS sites are expensive to run, requiring personnel in the field for long periods during the breeding season and may prove logistically challenging on the islands where available housing is limited and spring winds can make mist-netting impossible.

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APPENDIX A

Channel Islands National Park

Landbird Monitoring Data

1995–2000

Table 16. Landbird abundance from line transects, spring, 1995.

	SBI			SMI				
	3/18	3/17	3/18	4/7	4/6	4/7	4/6	4/5
Common Name	ARCH	CNYN	SGNL	HRRS	LKBD	NDVR	SMHL	WLLW
Red-tailed Hawk	—	—	1	—	—	1	—	—
Northern Harrier	1	1	1	—	1	—	—	—
Merlin	1	—	1	—	—	—	—	—
Peregrine Falcon	—	—	1	—	1	—	—	—
American Kestrel	2	2	3	—	—	—	—	—
Barn Owl	—	6	—	—	—	—	—	—
Short-eared Owl	—	2	—	—	—	—	—	—
Long-eared Owl	—	1	—	—	—	—	—	—
Burrowing Owl	—	1	—	—	—	—	—	1
Anna's Hummingbird	—	—	—	—	—	—	—	1
Allen's Hummingbird	1	1	—	—	—	—	1	5
Say's Phoebe	—	5	—	—	—	—	—	—
Horned Lark	25	—	36	9	31	—	9	—
Barn Swallow	—	—	—	—	—	—	2	—
Common Raven	—	—	—	—	2	—	—	—
Rock Wren	—	—	—	—	—	2	—	—
Varied Thrush	1	—	—	—	—	—	—	—
European Starling	—	26	—	—	—	2	—	—
Yellow-rumped Warbler	—	8	11	—	—	—	—	—
Orange-crowned Warbler	1	10	—	5	5	15	6	16
Wilson's Warbler	1	—	—	—	—	—	—	—
Song Sparrow	—	1	—	21	19	16	13	63
Savannah Sparrow	1	1	3	—	—	—	—	—
Golden-crowned Sparrow	—	—	—	—	—	—	—	2
White-crowned Sparrow	47	86	7	—	—	—	—	4
Western Meadowlark	44	20	68	3	42	—	5	4
House Finch	—	1	—	—	—	2	—	9

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 17. Landbird abundance from line transects, spring, 1996.

	SBI			ANI	SMI		
	3/27	3/29	3/30	3/21	4/26	4/26	4/24
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	NDVR	WLLW
Red-tailed Hawk	—	—	—	1	—	—	—
Northern Harrier	1	1	—	—	—	—	—
Merlin	—	—	1	—	—	—	—
Peregrine Falcon	1	—	—	—	—	—	—
American Kestrel	1	1	—	2	—	—	—
Short-eared Owl	—	4	—	—	—	—	—
Allen's Hummingbird	—	1	—	—	—	—	5
Pacific-slope Flycatcher	—	—	—	—	—	2	—
Say's Phoebe	—	—	—	1	—	—	—
Horned Lark	21	3	23	—	13	—	1
Barn Swallow	—	—	—	2	—	1	—
Common Raven	—	—	—	2	—	—	—
Rock Wren	—	1	—	1	—	—	—
Bewick's Wren	—	—	—	1	—	—	—
European Starling	1	—	—	3	—	—	—
Yellow-rumped Warbler	—	—	—	40	—	—	—
Orange-crowned	3	7	—	10	—	9	15
Wilson's Warbler	—	—	—	—	—	—	—
Song Sparrow	—	—	—	—	16	13	18
Savannah Sparrow	6	1	6	—	—	—	—
Spotted Towhee	—	1	—	—	—	—	—
Golden-crowned	—	—	—	1	—	1	—
White-crowned Sparrow	38	22	17	35	1	—	1
Hooded Oriole	—	—	—	—	3	—	—
Western Meadowlark	23	11	31	34	2	—	2
House Finch	—	—	—	1	1	2	8

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, NDVR = Nidever Canyon, WLLW = Willow Canyon

Table 18. Landbird abundance from line transects, fall, 1996.

	SBI			ANI	SMI			
	10/16	10/18	10/17	10/9	10/31	10/31	10/30	11/1
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	NDVR	SMHL	WLLW
Cooper's Hawk	—	—	—	—	—	—	1	—
Red-tailed Hawk	—	—	—	1	—	2	—	2
Northern Harrier	1	—	1	—	—	—	2	1
Merlin	—	1	—	—	—	—	—	—
Peregrine Falcon	1	—	4	—	—	—	1	—
American Kestrel	5	6	1	—	—	—	—	—
Killdeer	1	—	—	—	—	—	—	—
Barn Owl	—	3	—	—	—	—	—	—
Short-eared Owl	—	1	—	—	—	—	—	—
Burrowing Owl	—	1	1	2	—	—	—	—
Anna's Hummingbird	—	1	—	1	—	—	—	1
Allen's Hummingbird	—	—	—	—	—	—	—	7
Northern Flicker	—	—	—	—	1	2	—	1
Yellow-bellied Sapsucker	—	—	—	—	—	—	—	1
Black Phoebe	1	—	—	3	—	2	—	1
Say's Phoebe	7	4	6	2	2	2	2	1
Horned Lark	25	—	31	—	—	—	4	10
Common Raven	—	—	—	—	2	—	7	2
Red-breasted Nuthatch	—	2	1	—	—	—	—	—
Rock Wren	—	—	1	5	—	—	—	1
Bewick's Wren	—	—	—	2	—	2	—	4
House Wren	1	4	—	2	—	2	—	—
Ruby-crowned Kinglet	—	4	2	—	—	—	—	1
Hermit Thrush	1	—	—	—	—	—	—	2
Varied Thrush	—	—	—	—	—	4	—	—
American Robin	—	—	—	—	—	—	1	—
European Starling	—	—	—	22	—	—	—	12
Hutton's Vireo	—	—	—	—	—	—	—	—
Yellow-rumped Warbler	18	15	14	2	—	6	—	—
Common Yellowthroat	—	—	—	1	—	—	—	1
Orange-crowned Warbler	—	—	1	2	1	4	—	3
Rufous-crowned Sparrow	—	—	—	3	—	—	—	—
Dark-eyed Junco	10	—	1	—	—	—	—	—
Song Sparrow	—	—	—	—	37	24	57	44
Savannah Sparrow	13	4	11	17	—	—	—	—
Golden-crowned Sparrow	2	—	—	—	—	—	—	2
White-crowned Sparrow	6	11	1	19	1	—	5	10
Brewer's Blackbird	—	5	—	—	—	—	—	—
Western Meadowlark	16	12	37	25	17	—	51	66
House Finch	1	—	—	12	—	—	—	15

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 19. Landbird abundance from line transects, spring, 1997.

	SBI			ANI	SMI				
	3/19	3/21	3/20	4/16	4/4	4/2	4/4	4/2	4/3
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	LKBD	NDVR	SMHL	WLLW
Red-tailed Hawk	—	—	—	—	—	—	1	—	2
Northern Harrier	1	—	—	—	—	1	—	1	1
Merlin	—	1	—	—	—	1	—	—	—
Peregrine Falcon	—	—	2	—	—	—	—	1	—
American Kestrel	3	—	1	—	—	—	—	—	—
Barn Owl	—	3	—	—	—	—	—	—	—
Allen's Hummingbird	—	—	—	—	—	—	—	—	4
Northern Flicker	—	—	—	—	—	1	1	—	—
Horned Lark	17	—	15	—	5	12	—	10	—
Barn Swallow	—	—	—	2	—	—	1	—	—
Rock Wren	—	—	—	1	2	—	—	—	1
Bewick's Wren	—	—	—	2	—	—	—	—	—
Hermit Thrush	—	—	—	—	—	—	—	—	1
Northern Mockingbird	—	1	—	—	—	—	—	—	—
European Starling	4	—	—	1	—	—	1	—	—
Yellow-rumped Warbler	—	—	—	—	—	—	—	—	2
Orange-crowned Warbler	2	9	—	22	1	3	4	—	15
Song Sparrow	—	—	—	—	17	21	15	5	40
Savannah Sparrow	3	3	1	—	—	—	—	—	—
Golden-crowned Sparrow	—	—	—	—	—	—	1	—	—
White-crowned Sparrow	11	45	23	13	1	2	—	—	5
Western Meadowlark	14	11	18	10	6	26	—	5	2
House Finch	—	—	—	10	—	—	2	—	10

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 20. Landbird abundance from line transects, fall, 1997.

	SBI			ANI	SMI				
	10/29	10/31	10/30	11/6	10/14	10/15	10/14	10/15	10/16
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	LKBD	NDVR	SMHL	WLLW
Red-tailed Hawk	—	—	—	1	—	—	—	—	3
Northern Harrier	2	1	1	—	—	2	—	1	1
White-tailed Kite	1	—	—	—	—	—	—	—	—
Peregrine Falcon	1	—	1	1	—	—	—	—	—
American Kestrel	3	1	1	1	—	2	—	—	—
Mourning Dove	—	—	—	—	—	—	—	—	2
Barn Owl	1	6	—	—	—	—	—	—	—
Short-eared Owl	—	2	—	—	—	—	—	—	—
Burrowing Owl	—	—	—	—	—	—	—	—	1
Allen's Hummingbird	—	—	—	—	—	—	1	—	2
Northern Flicker	—	—	—	—	—	—	2	1	—
Black Phoebe	—	—	1	3	—	—	—	—	—
Say's Phoebe	4	4	2	5	—	4	—	2	3
Horned Lark	15	—	27	1	—	—	—	16	—
Common Raven	—	—	—	—	—	4	—	2	4
Rock Wren	—	—	—	—	—	—	—	—	1
Bewick's Wren	—	7	—	5	—	—	2	—	5
House Wren	—	3	—	3	—	—	—	—	—
Ruby-crowned Kinglet	—	3	—	—	—	—	—	—	2
Hermit Thrush	—	—	—	—	—	1	—	—	—
Mountain Bluebird	—	—	1	—	—	—	—	—	—
Yellow-rumped Warbler	1	1	—	—	—	—	—	—	—
Yellow Warbler	—	—	—	—	—	—	—	—	1
Common Yellowthroat	—	—	—	—	—	—	—	1	—
Orange-crowned Warbler	—	—	—	3	2	—	—	1	3
Dark-eyed Junco	2	—	—	—	—	—	—	—	—
Song Sparrow	—	—	—	—	29	23	14	16	55
Savannah Sparrow	7	5	8	2	—	—	—	—	—
Spotted Towhee	—	1	—	—	—	—	—	—	—
Chipping Sparrow	—	—	—	—	—	1	—	—	—
Golden-crowned Sparrow	8	1	—	—	—	—	1	—	—
White-crowned Sparrow	—	—	—	24	—	2	2	—	—
Brewer's Blackbird	—	—	—	—	2	—	—	—	3
Western Meadowlark	15	23	33	16	4	9	—	2	—
Yellow-headed Blackbird	—	—	—	1	—	—	—	—	—
Lesser Goldfinch	—	—	—	—	—	—	—	—	1
House Finch	—	4	—	20	10	—	5	—	9

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 21. Landbird abundance from line transects, spring, 1998.

	SBI			ANI	SMI				
	4/9	4/13	4/10	3/20	4/17	4/15	4/17	4/15	4/16
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	LKBD	NDVR	SMHL	WLLW
Red-tailed Hawk	—	—	—	1	—	—	—	—	1
Northern Harrier	1	1	—	—	—	1	—	1	1
Merlin	—	—	1	—	—	—	—	—	—
Peregrine Falcon	—	—	1	2	—	—	—	—	—
American Kestrel	—	1	1	—	—	—	—	—	1
Barn Owl	—	2	—	—	—	—	—	—	—
Allen's Hummingbird	—	—	—	—	—	—	1	—	7
Black Phoebe	—	—	—	2	—	—	—	—	—
Western Kingbird	—	—	—	1	—	—	—	—	—
Horned Lark	7	—	11	—	2	10	—	3	1
Barn Swallow	—	—	—	2	—	—	—	—	—
Common Raven	—	—	—	—	—	—	—	8	2
Bewick's Wren	—	—	—	3	—	—	—	—	—
European Starling	—	—	—	1	2	—	—	—	—
Hutton's Vireo	—	—	—	—	—	—	—	—	1
Orange-crowned Warbler	4	3	—	6	1	3	4	2	10
Song Sparrow	—	—	—	—	15	18	11	8	22
Savannah Sparrow	3	2	—	3	—	—	—	—	—
Chipping Sparrow	—	—	—	1	—	—	—	—	—
Golden-crowned Sparrow	1	—	—	—	1	—	—	—	1
White-crowned Sparrow	8	11	4	4	—	—	—	—	2
Western Meadowlark	16	14	16	13	2	21	—	10	3
American Goldfinch	—	1	—	—	—	—	—	—	—
House Finch	—	—	—	3	—	—	2	—	4

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 22. Landbird abundance from line transects, fall, 1998.

	SBI		SMI			
	11/13	11/12	10/27	10/26	10/27	10/25
Common Name	ARCH	SGNL	LKBD	NDVR	SMHL	WLLW
Brandt's Cormorant	—	—	1	—	—	—
Red-tailed Hawk	—	—	—	1	1	—
Northern Harrier	1	1	1	2	3	1
American Kestrel	—	—	2	1	1	3
Burrowing Owl	—	—	—	—	—	2
Allen's Hummingbird	—	—	—	1	—	3
Northern Flicker	—	—	—	1	—	2
Black Phoebe	—	—	1	3	1	2
Say's Phoebe	4	3	4	1	3	1
Horned Lark	96	21	7	—	—	4
Common Raven	—	—	11	1	—	1
Rock Wren	3	2	—	—	—	1
Bewick's Wren	—	—	—	2	—	2
House Wren	1	—	1	2	—	9
Ruby-crowned Kinglet	—	1	—	—	—	—
Hermit Thrush	—	5	—	—	1	—
Townsend's Solitaire	1	—	—	—	—	—
Mountain Bluebird	1	—	—	—	—	—
European Starling	—	—	17	—	—	—
Yellow-rumped Warbler	2	—	—	—	—	7
Common Yellowthroat	—	—	—	2	—	7
Orange-crowned Warbler	—	—	11	1	5	21
Dark-eyed Junco	—	2	—	—	—	4
Song Sparrow	—	—	163	15	107	121
Savannah Sparrow	5	1	—	—	—	—
Fox Sparrow	—	—	—	—	2	—
Chipping Sparrow	1	—	—	—	—	—
Golden-crowned Sparrow	1	4	—	—	—	—
White-crowned Sparrow	5	12	3	—	2	2
Western Meadowlark	98	24	45	—	28	1

SBI = Santa Barbara Island, ARCH = Arch Point, SGNL = Signal Peak

SMI = San Miguel Island, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 23. Landbird abundance from line transects, spring 1999.

	SMI				
	4/8	4/24	4/8	4/24	4/25
Common Name	HRRS	LKBD	NDVR	SMHL	WLLW
Sharp-shinned Hawk	—	—	—	—	1
Peregrine Falcon	2	—	—	—	—
American Kestrel	—	—	—	—	1
Allen's Hummingbird	—	—	1	—	16
Horned Lark	2	32	—	4	—
Common Raven	1	—	—	—	2
Rock Wren	—	—	—	—	1
European Starling	—	6	—	—	—
Orange-crowned Warbler	4	1	6	6	37
Song Sparrow	17	46	14	23	56
White-crowned Sparrow	1	—	—	—	—
Western Meadowlark	6	49	—	23	—
House Finch	—	—	—	—	6

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 24. Landbird abundance from line transects, spring, 2000.

	SBI			ANI	SMI				
	5/19	5/17	5/18	3/23	3/31	4/27	3/30	4/27	3/29
Common Name	ARCH	CNYN	SGNL	TRLS	HRRS	LKBD	NDVR	SMHL	WLLW
Red-tailed Hawk	—	—	—	—	—	—	—	—	1
Northern Harrier	—	—	—	—	2	—	2	—	3
American Kestrel	—	—	—	1	—	—	—	—	4
Barn Owl	—	2	—	—	—	—	—	—	3
Allen's Hummingbird	—	—	—	—	2	—	—	1	7
Say's Phoebe	—	—	—	—	1	—	—	—	—
Horned Lark	27	9	35	—	3	18	—	8	—
Common Raven	—	—	—	—	—	3	—	5	10
Rock Wren	—	—	3	—	—	—	—	—	1
Bewick's Wren	—	—	—	3	1	—	—	—	—
Townsend's Warbler	1	—	—	—	—	—	—	—	—
Orange-crowned Warbler	5	40	—	19	19	1	13	16	43
Wilson's Warbler	1	—	1	—	—	—	—	—	—
Song Sparrow	—	—	—	—	11	5	11	26	24
White-crowned Sparrow	—	—	—	15	9	—	—	—	8
Western Meadowlark	29	19	11	—	8	19	—	2	1
House Finch	—	—	—	—	—	—	2	2	3

SBI = Santa Barbara Island, ARCH = Arch Point, CNYN = Canyons, SGNL = Signal Peak

ANI = Anacapa Island, TRLS = Trails

SMI = San Miguel Island, HRRS = Harris Point, LKBD = Dry Lakebed, NDVR = Nidever Canyon, SMHL = San Miguel Hill, WLLW = Willow Canyon

Table 25. Landbird abundance from point count transects, Santa Rosa Island 1994.

Common Name	LC 4/17	TP 4/17	LC 10/26	TP 10/27	IO 10/28
Sharp-shinned Hawk	—	—	—	—	1
Red-tailed Hawk	1	1	—	—	—
American Kestrel	7	—	4	1	3
California Quail	8	—	—	—	—
Mourning Dove	2	—	—	—	—
Anna's Hummingbird	—	—	1	—	—
Allen's Hummingbird	7	9	4	—	—
Pacific-slope Flycatcher	17	5	—	—	—
Black Phoebe	2	—	8	1	1
Say's Phoebe	—	—	2	—	—
Horned Lark	—	—	62	—	—
Barn Swallow	—	3	—	—	—
Common Raven	3	—	2	1	—
Rock Wren	2	—	2	—	—
Bewick's Wren	31	8	17	9	10
House Wren	—	—	3	—	—
Ruby-crowned Kinglet	—	—	17	2	6
Hermit Thrush	—	—	1	3	1
Varied Thrush	—	—	1	—	1
American Robin	—	—	—	—	8
Loggerhead Shrike	2	—	2	—	—
Yellow-rumped Warbler	1	—	1	13	12
Townsend's Warbler	—	—	—	—	1
Orange-crowned Warbler	21	1	11	—	2
Dark-eyed Junco	—	—	1	—	—
Song Sparrow	14	—	14	—	1
Spotted Towhee	14	—	10	8	2
Chipping Sparrow	21	18	—	—	—
Golden-crowned Sparrow	1	—	—	—	—
White-crowned Sparrow	1	—	7	—	—
Western Meadowlark	3	—	38	1	—
Lesser Goldfinch	—	1	4	—	—
House Finch	9	8	9	1	—

LC = Lobo Canyon, TP = Torrey Pines, IO = Island Oaks,

Table 26. Landbird abundance from point count transects, Lobo Canyon, Santa Rosa Island 1995

Common Name	5/4/1995
American Kestrel	5
California Quail	6
Mourning Dove	2
Anna's Hummingbird	2
Pacific-slope Flycatcher	28
Black Phoebe	9
Barn Swallow	2
Common Raven	2
Rock Wren	1
Bewick's Wren	20
Northern Mockingbird	1
European Starling	9
Orange-crowned Warbler	10
Song Sparrow	13
Spotted Towhee	18
Chipping Sparrow	7
House Finch	20

Table 27. Landbird abundance from point count transects, Santa Rosa Island, 1996.

Common Name	LC 4/3	IO 4/4	CC 11/6	LC 11/6	WD 11/6	TP 11/7	IO 11/8
Red-tailed Hawk	—	—	—	1	—	—	—
Merlin	—	—	—	—	—	1	—
American Kestrel	5	—	—	2	2	1	3
California Quail	—	—	—	—	3	—	—
Mourning Dove	4	—	—	—	—	—	—
White-throated Swift	4	—	—	—	—	—	—
Anna's Hummingbird	1	—	1	1	—	—	—
Allen's Hummingbird	1	—	—	—	—	—	—
Northern Flicker	—	—	—	1	1	1	—
Acorn Woodpecker	—	—	—	—	—	—	1
Black Phoebe	5	—	—	8	—	—	—
Say's Phoebe	—	—	2	—	1	—	2
Barn Swallow	7	—	—	—	—	—	—
Common Raven	3	4	1	—	2	2	—
Red-breasted Nuthatch	—	—	—	—	3	1	3
Rock Wren	1	—	—	2	2	—	—
Bewick's Wren	13	7	5	13	16	6	7
House Wren	—	—	—	6	—	—	—
Ruby-crowned Kinglet	4	2	2	18	9	1	1
Hermit Thrush	—	—	6	8	9	2	—
American Robin	—	—	1	—	1	2	—
Northern Mockingbird	—	—	—	1	—	—	—
European Starling	1	—	—	5	—	4	—
Hutton's Vireo	—	—	—	5	—	—	—
Yellow-rumped Warbler	—	—	—	—	—	2	5
Townsend's Warbler	—	—	—	—	—	—	2
Common Yellowthroat	—	—	—	5	—	—	—
Orange-crowned Warbler	9	6	—	8	—	—	1
Wilson's Warbler	3	—	—	—	—	—	—
Dark-eyed Junco	—	—	—	—	—	2	4
Song Sparrow	18	4	1	9	—	1	—
Spotted Towhee	6	2	2	9	7	3	—
Chipping Sparrow	5	4	—	—	—	—	—
White-crowned Sparrow	—	—	—	10	—	—	4
Western Meadowlark	2	7	—	7	—	—	—
Lesser Goldfinch	3	23	—	—	—	6	6
House Finch	23	23	1	12	15	9	6

LC = Lobo Canyon, IO = Island Oaks, CC = Cherry Canyon, WO = Mixed Woodland, TP = Torrey Pines

Table 28. Landbird abundance from point count transects, Santa Rosa Island, 1997.

Common Name	CC 4/10	WD 4/10	LC 4/11	LC 10/2	CC 10/2	WD 10/2	IO 10/2
Red-tailed Hawk	—	—	2	—	—	—	—
American Kestrel	1	—	4	1	1	—	1
California Quail	2	3	3	15	—	3	—
Mourning Dove	—	—	6	—	—	—	—
Anna's Hummingbird	1	2	—	—	—	—	—
Allen's Hummingbird	—	—	1	—	—	—	—
Northern Flicker	—	—	—	1	—	—	2
Pacific-slope Flycatcher	1	2	4	—	—	—	—
Black Phoebe	1	2	1	8	—	—	1
Say's Phoebe	—	—	—	1	1	3	2
Common Raven	—	1	—	2	3	—	5
Rock Wren	2	—	—	1	3	1	2
Bewick's Wren	4	9	11	31	1	10	4
House Wren	—	—	—	1	—	—	—
Ruby-crowned Kinglet	—	—	—	12	—	5	—
Orange-crowned Warbler	3	7	7	1	—	—	—
Song Sparrow	3	2	4	6	3	2	1
Spotted Towhee	2	7	5	14	7	9	2
Chipping Sparrow	5	11	9	—	—	—	—
Golden-crowned Sparrow	1	1	—	—	—	—	—
White-crowned Sparrow	—	—	—	2	—	—	—
Western Meadowlark	1	1	1	9	1	—	2
Lesser Goldfinch	2	1	4	—	—	—	—
House Finch	14	13	17	9	2	12	5

CC = Cherry Canyon, WO = Mixed Woodland, LC = Lobo Canyon, IO = Island Oaks

Table 29. Landbird abundance from point count transects, Santa Rosa Island, 1998.

Common Name	LC 4/22	CC 4/23	LC 4/23	WD 4/23	IO 4/24
Red-tailed Hawk	1	—	—	—	—
American Kestrel	4	—	—	1	—
California Quail	2	1	—	—	—
Mourning Dove	4	—	—	—	—
Anna's Hummingbird	1	—	—	—	1
Allen's Hummingbird	1	—	—	—	—
Pacific-slope Flycatcher	5	5	1	12	5
Black Phoebe	12	—	—	—	—
Common Raven	2	—	—	—	2
Rock Wren	4	1	2	—	—
Bewick's Wren	16	5	—	12	10
Loggerhead Shrike	3	—	—	—	—
European Starling	2	—	—	—	—
Hutton's Vireo	—	—	—	1	—
Hermit Warbler	—	—	—	1	—
Townsend's Warbler	—	—	—	1	—
Orange-crowned Warbler	6	2	—	4	3
Song Sparrow	17	2	2	—	2
Spotted Towhee	6	5	—	7	4
Chipping Sparrow	8	1	—	7	5
Western Meadowlark	2	4	—	2	1
House Finch	17	6	—	6	8

LC = Lobo Canyon, CC = Cherry Canyon, WO = Mixed Woodland, IO = Island Oaks

Table 30. Landbird abundance from point count transects, Santa Rosa Island, 2000.

Common Name	LC 4/22	LC 4/29	TP 4/30	LC 5/1	CC 5/2	WD 5/2
Mallard	—	1	—	—	—	—
Red-tailed Hawk	—	5	1	—	—	—
Peregrine Falcon	—	1	—	—	—	—
American Kestrel	—	2	—	2	—	—
California Quail	—	—	6	1	3	1
Mourning Dove	—	—	—	—	—	1
White-throated Swift	—	3	—	—	—	—
Anna's Hummingbird	—	2	9	—	—	—
Allen's Hummingbird	1	9	—	6	2	5
Pacific-slope Flycatcher	—	5	9	11	5	13
Black Phoebe	—	2	1	2	—	—
Say's Phoebe	—	1	—	—	—	—
Horned Lark	—	1	2	—	1	—
Barn Swallow	—	2	3	1	—	—
Common Raven	1	8	2	1	—	—
Rock Wren	—	5	—	1	—	—
Bewick's Wren	2	9	14	7	5	9
House Wren	—	1	—	—	—	—
Ruby-crowned Kinglet	—	1	—	—	—	—
Varied Thrush	—	1	—	—	—	—
Loggerhead Shrike	—	2	—	—	—	—
Orange-crowned Warbler	—	8	6	7	3	4
Song Sparrow	1	12	2	8	2	1
Spotted Towhee	1	7	1	8	4	5
Chipping Sparrow	1	6	12	4	6	8
Western Meadowlark	—	1	6	8	1	2
Lesser Goldfinch	—	2	—	2	—	—
House Finch	—	5	15	9	7	7

LC = Lobo Canyon, TP = Torrey Pines, CC = Cherry Canyon, WO = Mixed Woodland